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(54) **COMPOSITION OF MICRONUTRIENTS AND ORGANIC COMPOUNDS FOR TREATING, COATING AND ENCRUSTING SEEDS**

(57) The present invention relates to compositions of micronutrients and organic compounds to be used in the treatment, coating and encrustation of seeds of cultivated plants, such as: *Brachiaria* spp. (*Brachiaria brizantha*, *Brachiaria decumbens*, *Brachiaria humidicola*, *Brachiaria mutica*, *Brachiaria ruziziensis*, *Brachiaria arrecta*, *Brachiaria dictyneura*), *Panicum* spp. (*Panicum maximum*), *Sorghum* spp., *Pennisetum americanum*, *Glycine max*, *Zea mays*, *Gossypium hirsutum*, greenery (*Solanum lycopersicum*, *Allium cepa*, *Lactuca sativa*, *Daucus carota*, *Capsicum annuum*), forestry (*Eucalyptus* spp., *Tectona grandis*, *Hevea brasiliensis*, *Pinus* sp.), *Nicotiana tabacum*, ornamental *Crotalaria* spp. (*Crotalaria juncea*, *Crotalaria spectabilis*, *Crotalaria ochroleuca*, *Crotalaria paulina*, *Crotalaria breviflora*).

Pertaining to the technical field of agricultural technology, these compositions are associated with the assistance and stimulation of the process of biological nitrogen fixation in the crop cycle, and advantageous in the event of abiotic stresses, mainly in the establishment and germination of the crop and stimulation of the plant growth provided by the components thereof. Particularly, the formulations are combinations of cobalt, molybdenum, nickel, amino acids, plant extracts and algae extracts, within the variations and proportions thereof, together with additives and excipients for improving the formulation of the product.

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**Description**

## FIELD OF APPLICATION

5 **[0001]** The present patent application refers to compositions of micronutrients and organic compounds to be used in the treatment, coating and encrustation of seeds of cultivated plants, more particularly compositions based on cobalt and molybdenum combined with amino acids, seaweed extracts and organic substances. Pertaining to the technical field of agricultural technology, these compositions are associated with the assistance and stimulation of the process of biological nitrogen fixation in the crop cycle, and advantageous in the event of abiotic stresses, mainly in the establishment and germination of the crop and stimulation of the plant growth provided by the components thereof. Particularly, the formulations are combinations of cobalt, molybdenum, nickel, amino acids, plant extracts and algae extracts, within the variations and proportions thereof, together with additives and excipients for improving the formulation of the product.

## STATE OF THE ART

15 **[0002]** In the current productive scenario, the increase in the productivity of crops is mainly due to the implantation of technological packages that benefit the crops. Amongst these technologies, the use of micronutrients, such as cobalt and molybdenum, can provide increments of up to 32.7% in the productivity of soy plants (Vitti et al. 1984). Similar results had been demonstrated by Hungria et al. (2007), where the treatment of seeds with molybdenum and cobalt has increased the productivity of soy by 20%. Either cobalt or molybdenum play a crucial role in the nutrition of plants, acting in basic metabolic routes to improve the development thereof. Further, they act synergically in the biological nitrogen fixation: molybdenum assists in the action of nitrogenase while cobalt, by means of cobalamine, prevents the inhibition of nitrogenase, thus regulating the concentration of oxygen in nodules (Ceretta et al., 2005; Araújo et al., 2008).

20 **[0003]** The required amounts of molybdenum and cobalt in small plants are small and the application thereof through the seed is one of the most practical and efficient forms of fertilization. In the marketplace there are commercial products that contain such micronutrients in variable concentrations, almost always in a 10:1 ratio (Mo:Co).

25 **[0004]** Besides the use of such micronutrients, the use of biostimulators to provide larger increments for the crop is ever growing through the years. Biostimulators are complex organic composites that promote the hormonal balance of plants, favoring the expression of the genetic potential thereof, stimulating the development of the root system (ONO et al., 1999). Said compounds act by degrading spare substances of the seeds in the cell differentiation, division and extension (CASTRO, 2001; VIEIRA, 2001). The phytohormones contained in biostimulators are signaling molecules, naturally present in the plants in basically small concentrations, being responsible for notable effects on the vegetal development (TAIZ & ZEIGER, 2004).

30 **[0005]** In accordance with Vieira (2001), biostimulators can be defined by the mixture of two or more plant regulators or the mixture of plant regulators with amino acids, vitamins and/or nutrients. Further, natural products, obtained from the extract of seaweed *Ascophyllum nodosum*, have also been used as biostimulators in several crops (BROWN, 2004 apud SBERSE, 2013).

35 **[0006]** Another natural source used as biostimulators includes amino acids (BRANDÃO, 2007; CAÇO, 2008), which are used to fulfill a large part of structural needs, assist in the synthesis of vitamins and several compounds such as enzymes, hormones and chlorophyll. They act in the storage and transport of nitrogen, thus acting directly in order to attain a bigger plant development together with a reduced energy waste, providing a reduction in the phytotoxicity of some agrochemicals, besides promoting a higher tolerance to hydric stress and frosts, higher blooming and increased productivity. The result of such benefits is an improved germination, production of plants with more developed roots, more vigorous plants, a more uniform filling of grains and higher productivity in the cultivation of soy. Ludwig et al. (2008). Thus, the introduction of biostimulators in the treatment, covering and encrustation of seeds, either isolated or in combination with other products have become a trend in the sector, provided it does not affect the quality of the seed.

40 **[0007]** The physiological quality of the seeds has been characterized by the germination and vigor, wherein the vigor of the seeds is the sum of attributes that provide the seed with a potential to germinate, emerge and quickly turn into normal plantules under a wide diversity of ambient conditions

45 **[0008]** (HOFS et al., 2004). Works show that the use of biostimulators for the treatment of mildew seeds in general, do not jeopardize the germination and vigor of same, and they can also provide an increase in the root in relation to non-treated seeds (Weber, 2011; Ono et al., 1999; Silva et al. 2008). Notwithstanding, some regulators contain micronutrient in their formulations, and these are inserted to minimize problems caused by eventual deficiencies, during the processes of germination, development and production of seeds.

50 **[0009]** Thus, the object of the present patent meets the need to develop effective formulations that associate biostimulators to the use of micronutrients such as cobalt, molybdenum and nickel in the cultivation of soy. These formulations involve the associated use of different sources of biostimulators with different associations of micronutrients. Additionally, the invention refers to the effective use of seaweed extracts, amino acids, *S. rebaudiana* extract, cobalt, molybdenum,

and nickel concomitantly with additives and excipients, in liquid formulations with properties for the use in the treatment, covering and encrustation of seeds of cultivated plants.

## OBJECTS OF THE INVENTION

5  
**[0010]** Thus, the object of the present invention is to apply compositions of micronutrients and organic compounds to be used in the treatment, covering and encrustation of seeds of cultivated plants including, but not limited to, *Brachiaria* spp. (*Brachiaria brizantha*, *Brachiaria decumbens*, *humidicola Brachiaria*, *mutica Brachiaria*, *Brachiaria ruziziensis*, *Brachiaria arrecta*, *Brachiaria dictyneura*), *Panicum* spp. (*Panicum maximum*), *Sorghum* spp., *Pennisetum americanum*,  
 10 *Glycine max*, *Zea mays*, *Gossypium hirsutum*, greenery (*Solanum lycopersicum*, *Allium cepa*, *sativa Lactuca*, *Daucus carota*, *Capsicum annuum*), forestry (*Eucalyptus* spp., *Tectona grandis*, *Hevea brasiliensis*, *Pinus* sp.), *Nicotiana tabacum*, ornamental *Crotalaria* spp. (*Crotalaria juncea*, *Crotalaria spectabilis*, *Crotalaria ochroleuca*, *Crotalaria paulina*, *Crotalaria breviflora*). Pertaining to the technical field of agricultural technology, these compositions are associated with the assistance and stimulation of the process of biological nitrogen fixation in the crop cycle, and advantageous in the  
 15 event of abiotic stresses, mainly in the establishment and germination of the crop and stimulation of the plant growth provided by the components thereof. Particularly, the formulations are combinations of cobalt, molybdenum, nickel, amino acids, plant extracts and algae extracts, within the variations and proportions thereof, together with additives and excipients for improving the formulation of the product.

## 20 BRIEF DESCRIPTION OF THE INVENTION

**[0011]** The present invention refers to the effective use of compositions of micronutrients and organic compounds, concomitantly with additives and excipients, to be used or not in the treatment, covering and industrial encrustation of  
 25 seeds of cultivated plants.

## DETAILED DESCRIPTION OF THE INVENTION

**[0012]** The compositions of the formulations exhibit, but without limitation, a final concentration of (percentage, g.Kg<sup>-1</sup>; Table 1):  
 30

**Table 1.** Concentrations for the preparation of the probiotic composition

Nutrients	Concentration		
	Formula 1	Formula 2	Formula 3
Molybdenum	0.1 - 20.0%	0.1 - 20.0%	0.1 - 20.0%
Cobalt	0.1 - 5.0%	0.1 - 5.0%	0.1 - 5.0%
Nickel	--	--	0.1 - 5.0%
Amino acid	0.1 - 20.0%	--	--
Brown seaweed extract <sup>1</sup>	0.1 - 20.0%	0.1 - 20.0%	0.1 - 20.0%
<i>S. rebaudiana</i> extract	--	0.1 - 5.0%	0.1 - 5.0%
Additive	0.1 - 10.0%	0.1 - 10.0%	0.1 - 10.0%
Excipient (q.s.p.)	100%	100%	100%

**[0013]** <sup>1</sup>The brown seaweed extract can be, but not limited to, *Ascophyllum nodosum*, *Macrocystis pyrifera*, *Ecklonia maxima*, *Durvilalea antarctica*, *Durvilalea potatorum*, and combinations thereof.

50 **[0014]** The additives are dispersants chosen from the group consisting of water-soluble ionic polymers, water-soluble anionic polymers, surfactants selected from the group consisting of anionic surfactants and non-ionic surfactants, and combinations thereof.

**[0015]** The excipients belong to the group consisting of silicas, talc, bentonite, carbohydrates, carbonates, starches, sugars, saccharides, and combinations thereof.

55 **[0016]** The composition should be used as a liquid formulation for treatment, covering and encrustation of seeds. However, other formulations containing said combinations such as concentrated emulsions, suspensions, etc., may also be used.

WORKING EXAMPLES

[0017] Three formulations containing different ratios and combinations between micronutrients; molybdenum, cobalt, nickel and biostimulators; seaweed extract, *S. rebaudiana* extract, and amino acids and their incipients were prepared for treatment of soy seeds. The example below illustrates, but without limitation, the use of said composition.

EXAMPLE 1

[0018] Association of micronutrients with biostimulators in the treatment of soy seeds.

OBJECT

[0019] To evaluate formulations based on As and CoMoNi associated to biostimulators in the treatment of seeds and their effect on the productivity of soy.

MATERIAL AND METHODS

[0020] A statistical layout containing randomly arranged blocks (DBC) with six treatments and four repetitions making out 24 experimental units was used. Each experimental unit was composed by 6 planting lines 10 m long, totaling 27 m<sup>2</sup> per portion. However, for the useful area 4 central lines were used, discarding 1.5 m from each extremity, totaling 12.6 m<sup>2</sup> of useful portion. The planting was carried out on 05/18/2017 in Fazenda Boa Esperança, located in the city of Lagoa da Confusão/TO, using cultivar 8579RSF IPRO (BONUS IPRO). The phytosanitary handling, fertilization and culture tracts were carried through as usual by following the crop recommendations. The evaluated formulas are described in Table 2.

**Table 2.** Concentration of nutrients used for the composition of the three evaluated formulations.

Nutrients	Concentration		
	Formula 1	Formula 2	Formula 3
Molybdenum	0.1 - 20.0%	0.1 - 20.0%	0.1 - 20.0%
Cobalt	0.1 - 5.0%	0.1 - 5.0%	0.1 - 5.0%
Nickel	--	--	0.1 - 5.0%
Amino acid	0.1 - 20.0%	--	--
Brown seaweed extract <sup>1</sup>	0.1 - 20.0%	0.1 - 20.0%	0.1 - 20.0%
<i>S. rebaudiana</i> extract	--	0.1 - 5.0%	0.1 - 5.0%
Additive	0.1 - 10.0%	0.1 - 10.0%	0.1 - 10.0%
Excipient (q.s.p.)	100%	100%	100%

[0021] These formulations have been evaluated by equalizing the concentrations of cobalt and molybdenum at the dosages of the treatments. Thus, the evaluated treatments were:

- 1) absolute control, no application;
- 2) commercial product based on As at a dose of 0.50 ml.Kg<sup>-1</sup> of seed;
- 3) CoMo at the dose of 0.66 ml.Kg<sup>-1</sup> seed;
- 4) Formulation 1 (As + seaweed + amino acid) at the dose of 1.54 ml.Kg<sup>-1</sup> of seed;
- 5) Formulation 2 (As + seaweed + *S. rebaudiana* extract) at the dose of 2.60 ml.Kg<sup>-1</sup> of seed; and
- 6) Formulation 3 (CoMoNi + seaweed + *S. rebaudiana* extract) at the dose of 2.30 ml.Kg<sup>-1</sup> of seed.

[0022] The parameters evaluated in the crop cycle were:

- Phytotoxicity: Visual evaluations conducted 14, 35 and 80 days after the plantation (DAP) and attributed scores in accordance with the score range proposed by Melhorança (1984), viz: 1) no damage; 2) small alterations (discoloration, deformation) visible in some plants; 3) small alterations (discoloration, deformation) visible in many plants; 4) strong discoloration (yellowing) or reasonable deformation without however, the occurrence of necrosis (death

of the tissue); 5) necrosis (burn) of some leaves, especially at the edges, followed by deformation in leaves and sprouts; 6) more than 50% of leaves and sprouts showing necrosis (deformation); 7) more than 80% of leaves and sprouts destroyed; 8) extremely serious damages, only small green areas remaining in the plants; 9) death of the plant.

- Plant stand: The stand evaluation was carried out by counting all plantules whose cotyledons were above ground level (phenologic stage VE). This evaluation was carried out at the 14<sup>th</sup> day after planting and at the harvest.
- Height of plant and development of roots: The height of plants and the development of roots were evaluated by removing five plants consecutively from each portion. The plants were collected with the aid of a shovel or hoe, aiming at removing the highest possible amount of roots. The measurements were made by measuring the base of the plant until the last insertion in order to evaluate the height, and then measuring same from the base of the neck to the length of the last root. The evaluation was made at the 35<sup>th</sup> day after planting.
- Number of pods: At the 80<sup>th</sup> day after planting, eight plants were consecutively removed from each portion, and the number of pods per plant was counted.
- Productivity: The plants were harvested and conditioned in raffia bags so that the collected grains can be sorted and weighed then. The grain humidity values at the harvest were noted down for a posterior 13% correction, considering the equation:

$$P_{13\%} = P_r - P_r * \frac{(U_r - U_{13\%})}{100}$$

where: P<sub>13%</sub> = weight of the grains corrected to a 13% humidity; P<sub>r</sub> = real weight of the portion, without correcting the humidity; U<sub>r</sub> = real humidity of the grains at the harvest; U<sub>13%</sub> = Humidity considered, that is, 13%. After the collected grains were weighed, the following equation was used:

$$\text{Prod(sc/ha)} = \frac{(P_{13\%}/C * E * n) * 10,000}{100}$$

where: Prod = Productivity in bags/ha; P<sub>13%</sub> = Weight of the grains corrected to 13% humidity; C = Length of the collected line; E = Spacing between planting lines; n = Number of collected planting lines; to calculate the productivity expressed in sc.ha<sup>-1</sup>.

- Weight of 1,000 grains (PMG): it was quantified using two samples containing 100 seeds each, with each meter for counting 50 seeds exclusively. The resulting value was expressed in grams and then turned into the weight of 1,000 grains.

**[0023]** The data obtained for the evaluated parameters were submitted to the variance analysis. The comparisons of the averages were made through the Scott-Knott test (p<0.05).

## RESULTS AND DISCUSSION

**[0024]** In the first evaluation at the 14<sup>th</sup> day after planting there was a significant stand difference between treatments (p<0.05) (Table 1). Treatments 3, 4, 5 and 6 had an initial start better than the absolute control (treatment 1) and the standard used by the farm (treatment 2). Additionally, no phytotoxicity difference between treatments was detected (p>0.05).

**Table 1** - Results obtained in parameters observed at the 14<sup>th</sup> day after planting, first evaluation.

Treatments	Stand	Phytotoxicity
	Number of plants/m	
1 Control	13.5 b	2.0 a
2 Commercial CoMo	15.3 b	2.0 a
3 CoMo	16.7 a	2.0 a
4 CoMo/seaweed/amino acid	17.6 a	2.0 a
5 CoMo/seaweed/S. rebaudiana extract	18.9 a	2.0 a
6 CoMoNi/seaweed/S. rebaudiana extract	18.3 a	2.0 a

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(continued)

Treatments	Stand	Phytotoxicity
	Number of plants/m	
VC (%)	7.24	0.0
<b>Note:</b> Treatments 4 the 6 represent formulations 1 to 3, respectively. Averages followed by the same letter in the column do not differ from one another for the Scott-Knott test at 5% probability. VC: Variation coefficient.		

**[0025]** The initial evaluation at the 14<sup>th</sup> day after planting also evidenced the role of nutrients cobalt (Co) and molybdenum (Me) in the physiology of the crop, influencing the number of plants emerged in the treatments that used said micronutrients. Said evaluation showed that the use of different formulations of said micronutrients can influence the availability of the same for the plant, as can be noticed in relation to treatment 2 compared to the other treatments, attaining increments between 9.15 and 23.52%.

**[0026]** In the evaluation at the 35<sup>th</sup> day after planting there was no significant difference for the phytotoxicity between treatments ( $p>0.05$ ) (data not shown). In relation to the height and length of roots, there was a significant interaction ( $p<0.05$ ) between the absolute control (treatment 1) and the other treatments. There was no significance ( $p>0.05$ ) for the parameters weight of the original substance (MO) of the root and the aerial portion between treatments (Table 2).

**Table 2** - Results obtained in parameters observed at the 35<sup>th</sup> day after planting, second evaluation.

Treatments	Height	Root	MO Root	MO Aerial
	(cm)	(cm)	(g)	(g)
C1 Control	28.6 b	14.3 b	22.3 a	144.5 a
2 Commercial CoMo	32.1 a	16.9 a	22.5 a	139.5 a
3 CoMo	33.3 a	18.9 a	26.8 a	165.8 a
4 CoMo/seaweed/amino acid	32.6 a	17.7 a	22.0 a	126.5 a
5 CoMo/seaweed/S. rebaudiana extract	32.8 a	18.4 a	23.3 a	131.8a
6 CoMoNi/seaweed/S. rebaudiana extract	33.8 a	17.6 a	22.3 a	139.3 a
VC (%)	2.86	10.99	16.11	17.31
<b>Note:</b> Treatments 4 the 6 represent formulations 1 to 3, respectively. Averages followed by the same letter in the column do not differ from one another for the Scott-Knott test at a 5% probability. VC: variation coefficient.				

**[0027]** The increment in the height of plants shows the importance of micronutrients Co and Me for the plant biological fixation cycle, since this provides energy and nutrients from the use of Nitrogen, which are transformed and incorporated to be assimilated into the plant.

Said use of Co and Mo provided increments that ranged from 12.23 to 18.18% for the height of plants and from 18.18 to 32.16% for the length of roots (Table 2). The increase of the length of roots derives from the energy generated from the biological nitrogen fixation (FBN) and from a better use of the available water.

**[0028]** At the 80<sup>th</sup> day after planting, there was no significant difference for phytotoxicity between treatments ( $p>0.05$ ) (date not shown) or for the parameters height, grains per pod and pods per node (Table 3). In relation to the number of pods and the number of nodes, there was a significant interaction ( $p<0.05$ ) between treatments.

**Table 3** - Results obtained in parameters observed at the 80<sup>th</sup> day after planting, third evaluation.

Treatment	Height (cm)	Number of pods	Grains/pods	Number of nodes	Pods/node
1 Control	64.6 a	35.0 a	2.0 a	13.8 a	2.5 a
2 Commercial CoMo	64.1 a	28.9 b	2.0 a	12.6 a	2.3 a
3 CoMo	70.6 a	29.1 b	2.1 a	13.1 a	2.2 a
4 CoMoNi/seaweed/amino acid	68.1 a	31.5b	2.1 a	13.5 a	2.3 a

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(continued)

Treatment	Height (cm)	Number of pods	Grains/pods	Number of nodes	Pods/node
5 CoMo/seaweed/S. rebaudiana extract	65.3 a	28.6 b	2.0 a	13.6 a	2.1 a
6 CoMoNi/seaweed/S. rebaudiana extract	67.1 a	22.3 c	2.1 a	10.0 b	2.2 a
VC (%)	4.25	10.68	4.1	10.96	7.82

**Note:** Treatments 4 the 6 represent formulations 1 the 3, respectively. Averages followed by the same letter in the column do not differ from one another for the Scott-Knott test at a 5% probability. VC: Variation coefficient.

[0029] With relation to the number of pods, the highest value was observed in the absolute control (treatment 1), differing from all treatments (Table 3). This condition can be correlated with the plant stand of the treatment. By virtue of the lower number of plants in the absolute control, there was a lower competition for light and nutrients, thus making more net energy available for a lower number of plants. The other treatments did not differ from one another. However, there was an exception for treatment 6 that exhibited a lower value between same, and probably was correlated with the lower number of nodes when compared with other treatments ( $p < 0.05$ ).

[0030] The harvest of the portions showed that there was a significant difference ( $p < 0.05$ ) in relation to the final plant stand in the treatments. Treatment 1 (absolute control) differed from the other treatments, exhibiting a lower number of plants (Table 4). This fact can be directly correlated to the use of micronutrients Co and Me, since the treatments that used said nutrients showed a higher plant stand in the first evaluation and maintained said values along this study (Table 4).

**Table 4** -Variation in plant stand at the 14<sup>th</sup> day after harvest.

Treatments	Plant stand		
	14 <sup>th</sup> day after planting	Harvest	Variation
1 Control	13.5 b	11.3 b	-2.25%
2 Commercial CoMo	15.3 b	15.3 a	0.0%
3 CoMo	16.7 a	18.0 a	1.30%
4 CoMo/seaweed/amino acid	17.6 a	17.8 a	0.15%
5 CoMo/seaweed/S. rebaudiana extract	18.9 a	18.5 a	-0.40%
6 CoMoNi/seaweed/S. rebaudiana extract	18.3 a	17.5 a	-0.80%
VC (%)	7.24	14.2	-

**Note:** Treatments 4 the 6 represent formulations 1 the 3, respectively. Averages followed by the same letter in the column do not differ from one another for the Scott-Knott test at a 5% probability. VC: Variation coefficient.

[0031] In parameter productivity, there was a significance ( $p < 0.05$ ) in different treatments, wherein treatments 3, 4 (formulation 1) and 5 (formulation 2) attained the best results. Treatment 1 (absolute control) showed the worse result observed. Treatments 2 (commercial CoMo) and 6 (formulation 3) showed intermediate values. There was no significant difference ( $p > 0.05$ ) for the humidity of the grains among treatments (Table 4).

**Table 5** - Results obtained in parameters observed in the harvest of treatments, last evaluation.

Treatments	Average humidity	Weight of 1,000 grains	Productivity
	(%)	(g)	Sc/ha
1 Control	10.1 a	71.6 a	40.8 c
2 Commercial CoMo	10.9 a	61.0 a	51.1 b
3 CoMo	10.5 a	71.7 a	57.8 a
4 CoMo/seaweed/amino acid	10.7 a	68.5 a	62.0 a

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(continued)

Treatments	Average humidity	Weight of 1,000 grains	Productivity
	(%)	(g)	Sc/ha
5 CoMo/seaweed/S. rebaudiana extract	10.8 a	64.9 a	59.8 a
6 CoMoNi/seaweed/S. rebaudiana extract	11.0 a	62.7 a	51.1 b
VC (%)	7.66	22.82	4.89
<b>Note:</b> Treatments 4 the 6 represent formulations 1 the 3, respectively. Averages followed by the same letter in the column do not differ from one another for the Scott-Knott test at a 5% probability. VC: Variation coefficient.			

**[0032]** Compared to treatment 1, treatments 3 the 5 showed a productivity gain that ranged from 10.3 to 21.2 sc/ha, that is, an increase from 25.24 to 51.96%. Further, compared to treatment 2 (commercial CoMo), treatments 3 the 5 showed a higher productivity ranging from 6.7 to 10.9 sc/ha, that is, an increase from 13.11 to 21.33%.

### CONCLUSIONS

**[0033]** The formulations evaluated herein evidence the fact that the use of micronutrients Co, Me and Ni associated to biostimulators provide significant increments in the productivity of soy plants and, consequently, a higher profitability to the farmer. Its use is a viable alternative to increase the productivity indices as well as improve the vigor and emergence in soy crops.

### FUNCTIONING OF THE INVENTION

**[0034]** The preparation of the formulation should follow the following flow of events:

- Severe aseptic and clean conditions should be implanted to assure a contamination free product;
- Raw materials: the raw materials that will make up the product should be received and manipulated by trained people;
- Mixture: the raw materials should be weighed and mixed according to the standard operational procedure (SOP) at the ratios prescribed;
- Sampling: after the mixture, samples for verification and certification of the guarantee of the product should be taken. The guarantees proposed for each product (%) should be analyzed;
- Packing: the formulated product that exhibits the guarantee specifications should be packed in previously labeled 1.0; 5.0; 20.0 or 1,000 liter drums;
- Storage: the drums should be arranged on wood pallets and stored in a dry, aired and light-protected place, and remain under such condition until it is dispatched.

**[0035]** The present invention may be applied or not by means of treatment, covering or industrial encrustation of seeds, using planting bars, plantation furrows or "on farm" treatment. The application method should be analyzed case by case and will depend on the technical conditions and the needs of every producer.

### ADVANTAGES ATTAINED

**[0036]** It was demonstrated here that the present invention:

- Is a viable alternative for the implementation of biostimulators in cultivated plants;
- Provides the crops with an increased vigor;
- Provides a better plant stand in the emergence, and consequently maintains a high plant stand in the crop cycle;
- Provides a better root formation, and consequently protection against abiotic stress;
- Increases the productivity indices of the crops.

**[0037]** The scope of the present patent should not be limited to the working examples, but to the terms defined in the claims and its equivalents.

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[0038]

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## Claims

- 55 1. **COMPOSITION OF MICRONUTRIENTS AND ORGANIC COMPOUNDS FOR TREATING, COATING AND ENCRUSTING SEEDS, characterized by** comprising the following nutrients in percentage, g.Kg<sup>-1</sup>:

## EP 3 845 068 A1

Molybdenum	0.1 - 20.0%
Cobalt	0.1 - 5.0%
Amino acid	0.1 - 20.0%
Brown seaweed extract	0.1 - 20.0%
Additive	0.1 - 10.0%
Excipient (q.s.q)	100%

2. **COMPOSITION OF MICRONUTRIENTS AND ORGANIC COMPOUNDS FOR TREATING, COATING AND ENCRUSTING SEEDS, characterized by** comprising the following nutrients, as a percentage g.Kg<sup>-1</sup>:

Molybdenum	0.1 - 20.0%
Cobalt	0.1 - 5.0%
Brown seaweed extract	0.1 - 20.0%
Stevia rebaudiana extract	0.1 - 5.0%
Additive	0.1 - 10.0%
Excipient (q.s.q)	100%

3. **COMPOSITION OF MICRONUTRIENTS AND ORGANIC COMPOUNDS FOR TREATING, COATING AND ENCRUSTING SEEDS, characterized by** comprising the following nutrients, as a percentage, g.Kg<sup>-1</sup>:

Molybdenum	0,1 - 20.0%
Cobalt	0,1-5.0%
Nickel	0.1 - 5.0%
Brown seaweed extract	0.1 - 20.0%
Stevia rebaudiana extract	0.1 - 5.0%
Additive	0.1 - 10.0%
Excipient (q.s.q)	100%

4. **COMPOSITION OF MICRONUTRIENTS AND ORGANIC COMPOUNDS FOR TREATING, COATING AND ENCRUSTING SEEDS, according to claims 1, 2 and 3, characterized in that** the brown seaweed extract is selected from the group consisting of *Ascophyllum nodosum*, *Macrocystis pyrifera*, *Ecklonia maxima*, *Durvilalea antarctica*, *Durvillaea potatorum*, and combinations thereof.

5. **COMPOSITION OF MICRONUTRIENTS AND ORGANIC COMPOUNDS FOR TREATING, COATING AND ENCRUSTING SEEDS, according to claims 1, 2 and 3, characterized in that** the additives are dispersants selected from the group consisting of water-soluble ionic polymers, water-soluble anionic polymers, surfactants selected from the group consisting anionic surfactants and non-ionic surfactants, and combinations thereof.

6. **COMPOSITION OF MICRONUTRIENTS AND ORGANIC COMPOUNDS FOR TREATING, COATING AND ENCRUSTING SEEDS, according to claims 1, 2 and 3, characterized in that** the excipients are selected from the group consisting of silicas, talc, bentonite, carbohydrates, carbonates, starches, sugars, saccharides, and combinations thereof.

7. **COMPOSITION OF MICRONUTRIENTS AND ORGANIC COMPOUNDS FOR TREATING, COATING AND ENCRUSTING SEEDS, according to claim 1, characterized in that** it is used in a wettable powder formulation, emulsions, suspensions, concentrated suspensions, and granules.

8. **COMPOSITION OF MICRONUTRIENTS AND ORGANIC COMPOUNDS FOR TREATING, COATING AND ENCRUSTING SEEDS, according to claims 1, 2 and 3, characterized in that** it is used in the treatment, covering and encrustation of the seeds of cultivated plants, such as: *Brachiaria spp.* (*Brachiaria brizantha*, *Brachiaria decumbens*, *Brachiaria humidicola*, *Brachiaria mutica*, *Brachiaria ruziziensis*, *Brachiaria arrecta*, *Brachiaria dictyneura*), *Panicum*

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*spp. (Panicum maximum), Sorghum spp., Pennisetum americanum, Glycine max, Zea mays, Gossypium hirsutum, greenery (Solanum lycopersicum, Allium cepa, Lactuca sativa, Daucus carota, Capsicum annuum), forestry (Eucalyptus spp., Tectona grandis, Hevea brasiliensis, Pinus sp.), Nicotiana tabacum, ornamental Crotalaria spp. (Crotalaria juncea, Crotalaria spectabilis, Crotalaria ochroleuca, Crotalaria paulina, Crotalaria breviflora)*

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/BR2018/050425

5	A. CLASSIFICATION OF SUBJECT MATTER		
	<b>A01N65/00 (2009.01), A01N65/03 (2009.01), A01N65/12 (2009.01), C05D9/00 (2006.01)</b>		
	According to International Patent Classification (IPC) or to both national classification and IPC		
10	B. FIELDS SEARCHED		
	Minimum documentation searched (classification system followed by classification symbols)		
	<b>A01N</b>		
	Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
15	<b>A01N 65/00</b>		
	Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
	<b>CAPES, ESPACENET</b>		
20	C. DOCUMENTS CONSIDERED TO BE RELEVANT		
	Category*	Citation of document, with indication, where appropriate, of the relevant passages	
		Relevant to claim No.	
25	Y A	CN 101215206 A (SHANXI INST OF GEOL SURVEY[CN]) 09 July 2008 (2008-07-09) See abstract	1;4-8 2,3
	Y A	RU 2008127876 A (LOSEV VLADIMIR ALEKSANDROVICH [RU]) 20 January 2010 (2010-01-20) See abstract	1;4-8 2,3
30	Y A	Dourado-Neto, D.; Dario, J.A.; Martin, T.N.; Silva, M.R.; Pavinato, P.S.; Habitzreiter, T.L.; Mineral fertilizer with cobalt and molybdenum in soybean; <i>Semina: Ciências Agrárias</i> , Londrina, v. 33, supplement 1, p. 2741-2752, 2012 See abstract	1;4-8 2,3
35			
40	<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
45	* Special categories of cited documents:	"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	
	"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	
	"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	
	"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family	
	"O" document referring to an oral disclosure, use, exhibition or other means		
	"P" document published prior to the international filing date but later than the priority date claimed		
50	Date of the actual completion of the international search	Date of mailing of the international search report	
	31 December 2018	10 January 2019	
55	Name and mailing address of the ISA/ BR INSTITUTO NACIONAL DA PROPRIEDADE INDUSTRIAL Rua Mayrink Veiga nº 9, 6º andar cep: 20090-910, Centro - Rio de Janeiro/RJ	Authorized officer <b>Renata de Melo Aguiar</b> Telephone No. +55 21 3037-3493/3742	

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## INTERNATIONAL SEARCH REPORT

International application No.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Information on patent family members

International application No.

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